CONCISE COMMUNICATION

Pneumococcal aortitis, report of a case with emphasis on the contribution to diagnosis of positron emission tomography using fluorinated deoxyglucose

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We describe an 82-year-old male with pneumococcal aortitis of the descending aorta, visualized by echocardiography and positron emission tomography using fluorinated deoxyglucose (FDG-PET). Computed tomography is considered to be the best diagnostic imaging modality in infected aortic lesions; in this case, the use of FDG-PET, which gives the opportunity to distinguish between inflammatory and non-inflammatory aortic aneurysms, made an important contribution to the diagnosis.

Keywords pneumococcal aortitis, FDG-PET, vascular infection, imaging

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INTRODUCTION

Streptococcus pneumoniae, the most common cause of bacterial pneumonia, may also cause a wide range of unusual invasive infections with high morbidity and mortality. We describe a patient with pneumococcal aortitis of the descending aorta. A review of the literature shows that it is a rare and often fatal disease of elderly males with atherosclerotic disease [1,2]. Probably, the infection results from bacteremic seeding to a pre-existing aortic lesion such as an aortic aneurysm or local atherosclerosis. Since the symptomatology, i.e. fever, abdominal pain and back pain, is rather non-specific, the diagnosis is often made at post-mortem examination. Untreated, it is a fatal condition. At present, CT scanning is considered to be the best diagnostic method [3]. In this case, the use of positron emission tomography with [^{18}F]fluorodeoxyglucose (FDG-PET) and transesophagal ultrasound were of great help in establishing the diagnosis.

CASE REPORT

An 82-year-old male presented with a history of 6 weeks of recurrent fever, preceded by shaking chills and accompanied by abdominal and thoracic pain. His general practitioner had prescribed two courses of antibiotics for suspected urinary tract infection. His past record included myocardial infarction 26 years earlier, hypertension, and reflux esophagitis.

At presentation, he appeared only moderately ill. His temperature was 37.8 °C, and his blood pressure was 150/60 mmHg. There were crackles on the right side on auscultation of the lungs. The white blood cell count was 29.7×10^9/L, with 93% neutrophils and 4% band forms. The C-reactive protein (CRP) level was 128 mg/L. The chest X-ray revealed an infiltrate of the right lower lobe. Furthermore, there was broadening of the superior mediastinum, with a shift of the trachea to the right.

Two blood cultures drawn at admission yielded *S. pneumoniae*, susceptible to penicillin. Treatment was started with benzylpenicillin 6×1 million units, intravenously. In our search for an underlying host defense defect, we detected a monoclonal gammopathy of 11 g/L IgG (type kappa) with 0.03 g/L Bence Jones proteinuria. The patient did not fulfill the criteria for myeloma, because there was no marrow plasmacytosis and there were no bone lesions.

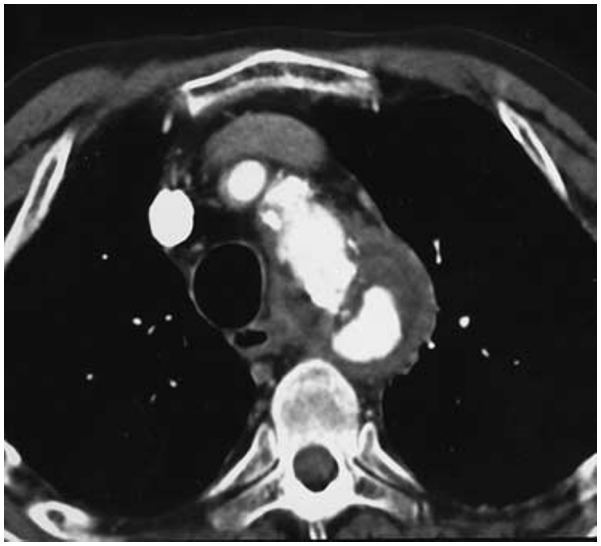

Figure 1 CT angiography. Transverse image at the level of the aortic arch showing extraluminal contrast medium adjacent to the aortic arch surrounded by a rim of soft tissue compatible with hematoma.

A CT scan revealed extraluminal contrast superior to the aortic arch, surrounded by hematoma, compatible with an aortic dissection (Figure 1). Syphilis serology was negative. Transesophageal ultrasound examination of the heart showed no valve abnormalities, but, in the descending aorta, a structure was seen resembling an old type B dissection of nearly 10 cm. On top of this structure, there was a floating mass of 0.8×1.0 cm, compatible with a vegetation (Figure 2). When asked, the patient recalled a nocturnal attack of severe pain between his shoulder blades, years earlier. He did not seek medical attention, so there were no records of this event. To gain further support for our hypothesis that this patient suffered from pneumococcal aortitis, due to bacteremic seeding to an old type B dissection, we performed an FDG-PET whole body scan, performed with a dedicated rotating half-ring PET scanner (ECAT-ART, Siemens/CTI, Knoxville, TN, USA). Activity was seen around the aortic arch (Figure 3). Based on the positive blood cultures, the CT image, the ultrasound findings and the FDG-PET images, we diagnosed pneumococcal aortitis. The dose of benzylpenicillin was raised to 12 million units/day by continuous infusion. Surgery was declined by the patient. Repeated CT scanning after 1 month showed the development of an aneurysm at the site of infection. By that time, the patient had developed hoarseness, most likely due to pressure on the recurrent laryngeal nerve. After 55 days of intravenous penicillin treatment, he left the hospital in good condition. He was switched to oral clindamycin. His blood pressure was 160/72 mmHg, with three antihypertensive agents. Four months after discharge from hospital, he was doing well; the CRP was not elevated. We intend to keep this 82-year-old man on clindamycin treatment.

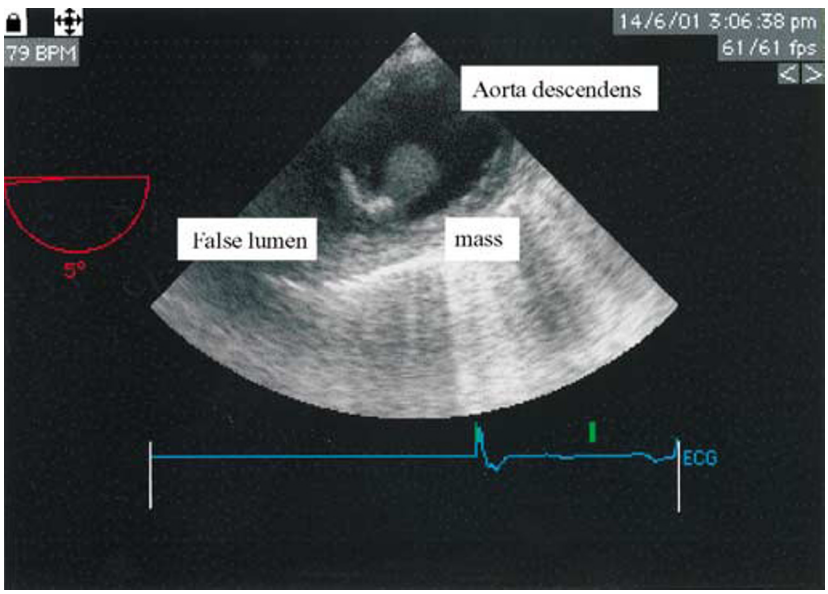

Figure 2 Transesophageal ultrasound. Transesophageal transversal image of the descending aorta showing a thickened intimal flap due to dissection, the false lumen, and the round vegetation protruding into the real lumen.

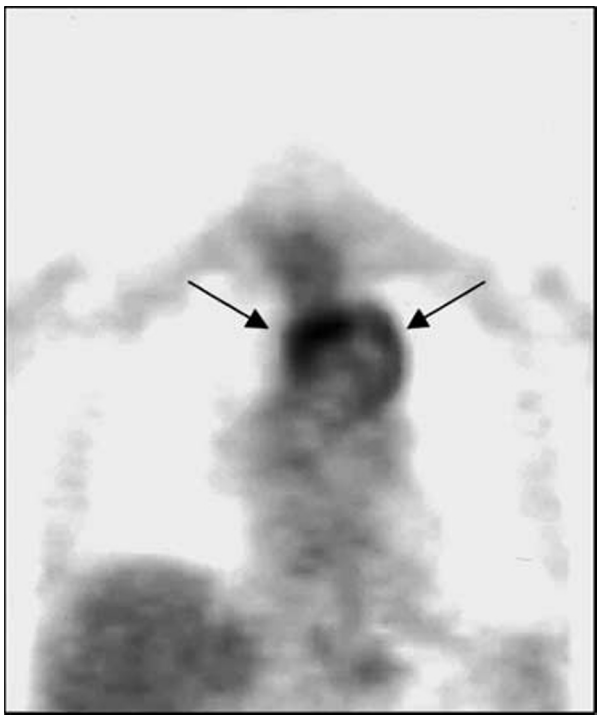

Figure 3 FDG-PET. Transmission-corrected coronal FDG-PET section of the chest at the level of the aortic arch, recorded 1 h after injection of 220 MBq of FDG. The arrows indicate FDG accumulation in the region of the aortic arch.

DISCUSSION

We present here a case of pneumococcal aortitis in which support for the diagnosis came from positive blood cultures, CT scanning, FDG-PET and echocardiography. Although pneumococcal aortitis, has been reported several times [1,2,4,5]. It is a rare complication and is thought to result from bacteremic seeding to a pre-existing aortic lesion. In the present case, this lesion was a type B aortic dissection, which most probably occurred in the context of hypertension.

Radiologic diagnosis of an infected aneurysm is generally performed with CT scanning, since it has proved to be the best diagnostic imaging modality in this situation [3]. Bronze et al. reviewed 28 cases of pneumococcal aortitis, and reported that CT was useful in 50% and magnetic resonance imaging (MRI) in 4%. It should be noted however, that quite often the diagnosis was made post-mortem. The most common findings were a discrete aortic aneurysm or a retroperitoneal mass [1]. In none of the 12 patients in whom the infection involved the ascending or descending aortic arch was any contribution of echocardiography reported. In our case, transesophageal ultrasound gave a clear picture of the dissection with a vegetation. Multiplane transesophageal echocardiographic examination of the descending aorta has a high sensitivity and specificity in the detection of acute and chronic aortic dissection, and is commonly preferred because of its widespread availability and easy use at the bedside. It is as valuable as spiral CT and MRI in the detection of thoracic aortic dissection [6].

Conventional scintigraphic techniques, such as those employing gallium-67 citrate- or indium-111-labeled leukocytes to evaluate infectious complications, may also be helpful in facilitating diagnosis, although most reports deal with infected vascular grafts in small series of patients [7,8]. Wang et al. considered gallium-67 to be of no diagnostic utility in mycotic aneurysms [9]. In the cases of pneumococcal aortitis reviewed by Bronze et al., only a few radionuclide scans were performed; most were non-conclusive diagnostically [1]. Ioannidis et al. describe a patient with a large mycotic pneumococcal aneurysm of the ascending aorta in whom a leukocyte scan showed no abnormal uptake anywhere in the chest [4].

What is new in this case is that FDG-PET contributed to the diagnosis. FDG-PET is a common diagnostic procedure for staging and restaging patients with malignancies. Currently, it is also used as a sensitive technique for delineation of inflammatory processes that may be located in the large arteries [10]. Blockmans et al. and Lorenzen et al. were able to diagnose several cases of non-infectious large vessel vasculitis by using FDG-PET in patients with fever of unknown origin, in whom conventional diagnostic techniques had been inconclusive [11,12]. The focal accumulation of FDG is caused by enhanced glycolysis of activated neutrophils and macrophages at sites of inflammation or infection [13]. Since FDG accumulates by virtue of targeting activated inflammatory cells, discrimination between sterile inflammation as, for instance, in Takayasu's aortitis, and infectious aortitis as shown in the present case report, will not be possible. FDG-PET, however, provides the opportunity to distinguish between inflammatory and non-inflammatory aneurysms, whereas with CT or ultrasound examination, differentiation between these conditions is not possible. More investigation is needed to evaluate the exact value of FDG-PET in diagnosing inflammatory vasculitis. When available, FDG-PET has clear

advantages in terms of resolution, high target-to-background ratio of uptake, and turnaround time (hours instead of days). Another merit of FDG-PET is the non-invasive nature of the examination. Whether FDG-PET should become the procedure of choice for the evaluation of vascular infection needs to be determined in larger comparative studies, taking into account the diagnostic yield, but also the availability and costs.

Besides imaging studies, the diagnosis in our patient was also based on blood cultures that yielded *S. pneumoniae*. In only half of the described cases in the literature were positive blood cultures obtained [1]. Recurrent pneumococcal bacteremia is known to be associated with multiple myeloma [14]. Our patient did not fulfill the criteria for myeloma, but it is possible that his M protein caused moderate immunodeficiency, due to loss of good opsonizing antipneumococcal antibodies. This may have been a predisposing condition for his pneumococcal bacteremia, which led to infection of what seemed to be a pre-existing dissection.

Another remarkable finding is that our patient is doing well, so far, with only antibiotic treatment. By analogy with endocarditis, treatment consisted of high-dose benzylpenicillin daily for at least 6 weeks [2]. Here, however, we chose to continue with oral antibiotics, because surgery was declined by the patient and thus was not an option in this case. The prognosis of pneumococcal aortitis is poor; the risk of dying from rupture of the aorta is high. Even with surgery, mortality rates of 40% are reported [2]. The mortality associated with non-surgical management may approach 90% [1].

In conclusion FDG-PET is introduced in the case of an 82-year-old male with pneumococcal aortitis, a rare and often fatal disorder as a new and promising technique to support the diagnosis made by positive blood cultures, CT scanning, and transesophageal ultrasound.

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